

CLAIMS

1. A method of compressing carbon dioxide, CO₂, comprising:
 - a) generating a stream of high-pressure oxygen gas (9) and a stream of high-pressure hydrogen gas (11) using a high-pressure electrolyser (3),
 - 5 b) feeding a reciprocating positive displacement pump (5) comprising a reciprocating member (5d), with a stream of CO₂ (6), and with the stream of high-pressure oxygen gas (9) as drive gas to actuate the reciprocating member (5d) and compress the CO₂ (6) to obtain a stream of high-pressure CO₂ (15).
- 10 2. The method as claimed in claim 1, comprising c) reacting the high-pressure CO₂ (15) with the high-pressure hydrogen gas (11) to obtain a synthetic hydrocarbon gas (13).
3. The method as claimed in any of the preceding claims, comprising feeding a second reciprocating positive displacement pump (17) comprising a
15 second reciprocating member (17d), with a stream of water (16), and the stream of high-pressure oxygen gas (11) as drive gas to actuate the second reciprocating member (17d) and compress the water to obtain a stream of compressed water (19).
4. The method as claimed in claim 3, wherein the second reciprocating
20 positive displacement pump (17) is a piston pump or a plunger pump.
5. The method as claimed in claim 3 or 4, comprising feeding the stream of compressed water (19) into the high-pressure electrolyser (3) as electrolyte to generate the stream of high-pressure oxygen gas (11) and the stream of high-pressure hydrogen gas (9).
- 25 6. The method as claimed in any of the preceding claims, wherein high-pressure is a pressure of at least 35 bar.

7. The method as claimed in any of the preceding claims, wherein the reciprocating positive displacement pump (5) is a piston pump or a plunger pump.
8. The method as claimed in any of the preceding claims, comprising
5 generating the stream of CO₂ (6) for the feeding in step b) by thermal decomposition of calcium carbonate (23).
9. A synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) comprising:
- a high-pressure electrolyser (3) having an oxygen gas outlet (3c) and a
10 hydrogen gas outlet (3b), wherein the high-pressure electrolyser (3) is configured to generate a stream of high-pressure oxygen gas (11) discharged through the oxygen gas outlet (3c) and a stream of high-pressure hydrogen gas (9) discharged through the hydrogen gas outlet (3b),
- a reciprocating positive displacement pump (5) comprising:
- 15 a CO₂ inlet (5a) configured to receive a stream of CO₂ (6),
- a CO₂ outlet (5c),
- a high-pressure gas inlet (5b) connected to the oxygen gas outlet (3c), and
- a reciprocating member (5d) configured to be actuated by the
20 high-pressure oxygen gas (11) as drive gas and compress the CO₂ (6) to obtain a stream of high-pressure CO₂ (15) discharged through the CO₂ outlet (5c).
10. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as claimed in claim 9, comprising a reactor (7) connected to the CO₂ outlet (5c)
25 and to the hydrogen gas outlet (3b), wherein the reactor (7) is configured to react the high-pressure CO₂ (15) and the high-pressure hydrogen gas (9) to obtain a synthetic hydrocarbon gas (13).

11. The synthetic hydrocarbon gas production system (1-2; 1-3) as claimed in claim 9 or 10, comprising a second reciprocating positive displacement pump (17) including:
- a water inlet (17a) configured to receive a stream of water (16),
 - 5 a water outlet (17c),
 - a second high-pressure gas inlet (17b) connected to the oxygen gas outlet (3c), and
 - a second reciprocating member (17d) configured to be actuated by the high-pressure oxygen gas (11) and compress the water (16) to obtain a stream
 - 10 of high-pressure water (19) discharged through the water outlet (17c).
12. The synthetic hydrocarbon gas production system (1-2; 1-3) as claimed in claim 11, wherein the high-pressure electrolyser (3) has an electrolyte inlet (3a), wherein the water outlet (17c) is connected to the electrolyte inlet (3a) to feed the high-pressure electrolyser (3) with the high-pressure water (19) as
- 15 electrolyte.
13. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as claimed in any of claims 9-12, wherein high-pressure is a pressure of at least 35 bar.
14. The synthetic hydrocarbon gas production system (1-1; 1-2; 1-3) as
- 20 claimed in any of claims 9-13, wherein the reciprocating positive displacement pump (5) is a piston pump or a plunger pump.
15. The synthetic hydrocarbon gas production system (1-3) as claimed in any of claims 9-14, comprising a thermal decomposition reaction chamber (21) configured to thermally decompose calcium carbonate, wherein the
- 25 thermal decomposition reaction chamber (21) comprises a thermal decomposition reaction chamber outlet (21b) connected to the CO₂ inlet (5a) of the reciprocating positive displacement pump (5).